Note: All questions carry equal marks .

Question 1 : Test the convergence or divergence of the sequence $\left\{\dfrac{\sin(3n)+3}{n^2+1}\right\}$ and if it converges , find its limit.

Question 2 : Find the sum of the series : $\left[\sum_{n=2}^{\infty}\dfrac{1}{n^2-1}+\sum_{n=1}^{\infty}\dfrac{2^n}{5^n}\right]$.

Question 3 : Determine whether the given series $\sum_{n=2}^{\infty}(-1)^n\dfrac{\sqrt{n}}{n+1}$ is absolutely convergent or conditionally convergent or divergent.

Question 4: Find the interval of convergence and radius of convergence of the power series $\sum_{n=2}^{\infty}(-1)^n\dfrac{(3x+5)^n}{n\,\ln n}$.

Question 5: Find the Maclaurin series of e^x and use it to find the Maclaurin series of $Sinh=\dfrac{e^x-e^{-x}}{2}$. Further find $\lim_{x\to 0}\dfrac{Sinh x}{x}$.